

GENETICS

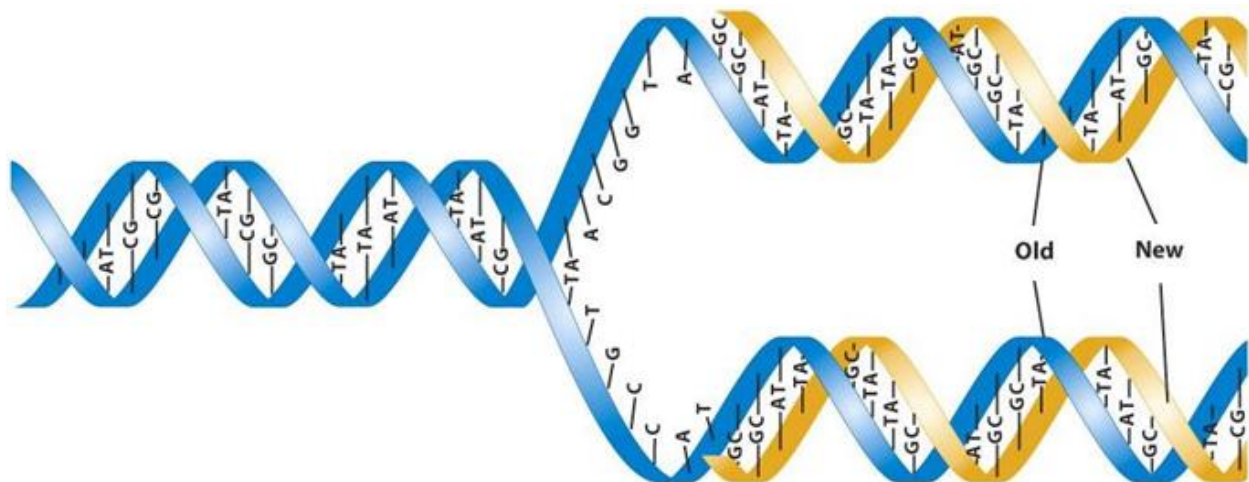
DNA REPLICATION & PROTEIN FORMATION

Learning Outcomes:

- I can describe the basic process of DNA replication.
- I can describe how a DNA gene sequence is used to make a protein.

DNA Replication

- prior to mitosis, all of the genetic material in a cell needs to be duplicated
- called DNA replication
 1. H-bonds between 2 strands of DNA of a chromosome are “unzipped” by the enzyme DNA helicase
 2. new nucleotides are attached to each strand of DNA following complimentary base pairing by the enzyme DNA polymerase
 - forms 2 identical double-stranded copies
 - called semi-conservative replication because one strand in each new chromosome is conserved from the original chromosome



Protein Formation

- gene sequence code the formation of a functioning protein (enzyme, structural protein, hormone, etc.)
- two-step process
 1. Transcription
 - since DNA is too large to fit through a pore in the nuclear membrane, it needs to create a smaller messenger
 - a gene sequence unwinds and one side of the chromosome is copied as a messenger RNA (mRNA)

DNA	RNA
• double stranded • bases are Adenine (A) – Thymine (T) and Cytosine (C) – Guanine (G) • sugar is deoxyribose	• single strand • bases are Adenine (A) – Uracil (U) and Cytosine (C) – Guanine (G) • sugar is ribose

example:

DNA T A C G C G A A T T G T C A C T A G A C C A C T
mRNA A U G C G C U U A A C A G U G A U C U G G U G A

2. Translation

- mRNA moves into the cytoplasm and binds with a ribosomal RNA (rRNA)
- rRNA translates the instructions in the mRNA into a chain of amino acids
- mRNA is read in sets of 3 bases called a codon that codes for a specific amino acid

		Second Letter				
		U	C	A	G	
1st letter	U	UUU Phe UUC UUA Leu UUG	UCU UCC Ser UCA UCG	UAU Tyr UAC UAA Stop UAG Stop	UGU Cys UGC UGA Stop UGG Trp	U C A G
	C	CUU CUC Leu CUA CUG	CCU CCC Pro CCA CCG	CAU His CAC CAA Gln CAG	CGU CGC Arg CGA CGG	U C A G
	A	AUU AUC Ile AUA AUG Met	ACU ACC Thr ACA ACG	AAU Asn AAC AAA Lys AAG	AGU Ser AGC AGA Arg AGG	U C A G
	G	GUU GUC Val GUA GUG	GCU GCC Ala GCA GCG	GAU Asp GAC GAA Glu GAG	GGU GGC Gly GGA GGG	U C A G

- example:
RNA AUG CGC UUA ACA GUG AUC UGG UGA
Amino Acid met – arg – leu – thr – val – ile – trp – stop
- chain of amino acids is then folded up into its functional shape